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CLAIMS

1. (Currently Amended) An apparatus for the rapid screening of potential reactants, catalysts or reaction conditions, the apparatus comprising:

a reaction substrate comprising a plurality of substrate reservoirs, said reaction substrate having a first temperature; and

a head plate positioned to provide a common sealed pressurized headspace adjacent to said substrate reservoirs, said head plate having a second temperature and said sealed pressurized headspace having an adjustable pressure in a range of between about 1 atmosphere and about 50 atmosphere,

wherein a reaction occurs within each substrate reservoir, and wherein said apparatus is structurally capable of being operated at temperatures up to at least about 200°C and at pressures from about 10 atmosphere up to at least about 50 atmosphere.

2. (Original) The apparatus of claim 1, further comprising a controller in communication with said reaction substrate and said head plate, wherein said controller maintains said reaction substrate at said first temperature and said head plate at said second temperature.

3. (Original) The apparatus of claim 1, further comprising;

a thermal unit in communication with said reaction substrate and

a controller in communication with said reaction substrate and said head plate, wherein said controller adjusts the temperature of said thermal unit to maintain said reaction substrate at said first temperature and wherein said controller adjusts the temperature of said head plate to maintain said head plate at said second temperature.

4. (Previously Presented) The apparatus of claim 1, further comprising a gas source in communication with said sealed pressurized headspace, wherein said gas source includes at least one gas.

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5. (Cancelled)

6. (Previously Presented) The apparatus of claim 1, wherein said adjustable pressure comprises a range of between about 10 atmosphere and about 45 atmosphere.

7. (Original) The apparatus of claim 6, wherein said adjustable pressure comprises a range of between about 10 atmosphere and about 20 atmosphere.

8. (Original) The apparatus of claim 1, further comprising at least one reactant system within at least one substrate reservoir, said reactant system being at least partially embodied in a liquid.

9. (Original) The apparatus of claim 8, wherein said at least one reactant system comprises a film having a thickness L.

10. (Original) The apparatus of claim 9, wherein said thickness L is sufficient to allow the reaction to be independent of the mass transport rate of a gas into said liquid.

11. (Original) The apparatus of claim 9, wherein said thickness L is independent of the effects of evaporation of said liquid.

12. (Original) The apparatus of claim 1, wherein at least one reactant is partially embodied in a gas.

13. (Previously Presented) The apparatus of claim 12, wherein said at least one reactant system comprises the atmosphere in said sealed pressurized headspace.

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14. (Currently Amended) An apparatus for the rapid screening of potential reactants, catalysts and reaction conditions, the apparatus comprising:

a reaction substrate comprising a plurality of substrate reservoirs;

a thermal unit in communication with said substrate reservoir to adjustably heat and cool said reaction substrate;

a head plate positioned to provide a common sealed pressurized headspace adjacent to said plurality of substrate reservoirs, wherein said sealed pressurized headspace comprises a high pressure seal between said head plate and said reaction substrate and wherein said sealed pressurized headspace comprises an adjustable pressure in a range of between about 10 atmosphere and about 50 atmosphere;

a plurality of temperature detectors, wherein at least one of said plurality of temperature detectors is positioned within each of said reaction substrate and said head plate;

a controller in communication with said plurality of temperature detectors, wherein said controller adjusts a temperature of said thermal unit to maintain said reaction substrate at a first temperature, and wherein said controller maintains said head plate at a second temperature; and

a plurality of reactant systems wherein each one of said plurality of reactant systems is positioned within a corresponding one of said plurality of substrate reservoirs, and wherein each of the plurality of reactant systems is at least partly embodied in a liquid film having a thickness L,

wherein a reaction occurs within each substrate reservoir, and wherein said apparatus is structurally capable of being operated at temperatures up to at least about 200°C and at pressures from about 10 atmosphere up to at least about 50 atmosphere..

15. (Previously Presented) The apparatus of claim 14, further comprising a gas source in communication with said sealed pressurized headspace, wherein said gas source includes at least one gas.

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17. (Previously Presented) The apparatus of claim 14, wherein said sealed pressurized headspace comprises a pressure ranging from about 10 atmosphere to about 45 atmosphere.

18. (Previously Presented) The apparatus of claim 17, wherein said sealed pressurized headspace comprises a pressure ranging from about 10 atmosphere to about 20 atmosphere.

19. (Original) The apparatus of claim 14, wherein at least one reactant is partially embodied in a gas.

20. (Original) The apparatus of claim 19, wherein said thickness L is sufficient to allow the reaction to be independent of the mass transport rate of said gas into said liquid and evaporation of said liquid.

21. (Previously Presented) A method for rapid screening of potential reactants, catalysts and reaction conditions, the method comprising:

adding a plurality of reactant systems at least partially embodied in liquid to a reaction substrate comprising a plurality of substrate reservoirs to form a plurality of liquid reactant systems, wherein the reaction substrate has an adjustable first temperature;

maintaining an adjustable pressure in a sealed headspace in communication with the reactant system;

adding a gas to the sealed headspace wherein the gas equilibrates with each of the plurality of liquid reactant systems;

maintaining said headspace at a second temperature;

allowing the gas to react with the plurality of liquid reactant systems for a predetermined amount of time; and

analyzing results thereof in an effort to discover potentially effective reactants, catalysts and reaction conditions,

wherein said plurality of reactant systems at least partially embodied in liquid each comprises a film having a thickness L.

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22. (Original) The method of claim 21, wherein the second temperature is greater than the first temperature.

23. (Original) The method of claim 21, further comprising providing an external controller, wherein the controller maintains the reaction substrate at said first temperature and the headspace at the second temperature.

24. (Original) The method of claim 21, wherein said plurality of reactant systems each comprises reactants dissolved, suspended, submersed, or entrained in said liquid.

25. (Original) The method of claim 21, wherein the adjustable pressure in said sealed headspace is in the range of between about 1 atmosphere and about 50 atmosphere.

26. (Original) The method of claim 25, wherein the adjustable pressure in said sealed headspace is in the range of between about 1 atmosphere and about 45 atmosphere.

27. (Original) The method of claim 26, wherein the adjustable pressure in said sealed headspace is in the range of between about 1 atmosphere and about 20 atmosphere.

28. (Original) The method of claim 21, wherein at least one reactant system is partially embodied in said gas.

29. (Original) The method of claim 21, wherein the gaseous reactant comprises the atmosphere in the headspace over the reaction substrate.

30. (Cancelled)

31. (Previously Presented) The method of claim 21, wherein said thickness L is sufficient to allow the reaction to be independent of the mass transport rate of a gaseous reactant into the liquid reactant system.

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32. (Previously Presented) The method of claim 21, wherein said thickness L is sufficient to allow the reaction to be independent of effects of evaporation of the liquid reactant system.

33. (Previously Presented) A method for rapid screening of potential reactants, catalysts and reaction conditions, the method comprising:

adding a plurality of reactant systems to a reaction substrate to form a plurality of liquid reactant systems, wherein the reaction substrate has an adjustable first temperature, and each of the plurality of reactant systems is at least partly embodied in a liquid film having a thickness L, wherein said thickness L is sufficient to allow the reaction to be independent of evaporation of the liquid film and the mass transport rate of a gas into the liquid;

maintaining an adjustable pressure in a sealed headspace in communication with the reactant system;

adding said gas to the sealed headspace, wherein said gas equilibrates with each of the plurality of liquid reactant systems;

maintaining the sealed headspace at an adjustable second temperature wherein the second temperature of the headspace is greater than the first temperature of the substrate reservoir;

allowing the gas to react with the plurality of liquid reactant systems for a predetermined amount of time; and

analyzing results thereof in an effort to discover potentially effective reactants, catalysts and reaction conditions.

34. (Original) The method of claim 33, further comprising externally controlling said first and second temperatures.

35. (Original) The method of claim 33, wherein said defined pressure in said enclosed headspace is in the range of between about 1 atmosphere and about 50 atmosphere.

36. (Original) The method of claim 35, wherein said defined pressure in said enclosed headspace is in the range of between about 1 atmosphere and about 45 atmosphere.

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37. (Original) The method of claim 36, wherein said defined pressure in said enclosed headspace is in the range of between about 1 atmosphere and about 20 atmosphere.

38. (Original) The method of claim 33, further comprising at least one reactant partially embodied in said gas.